Heavy Flavor MDC1

**Status and Plans**

Cameron Dean

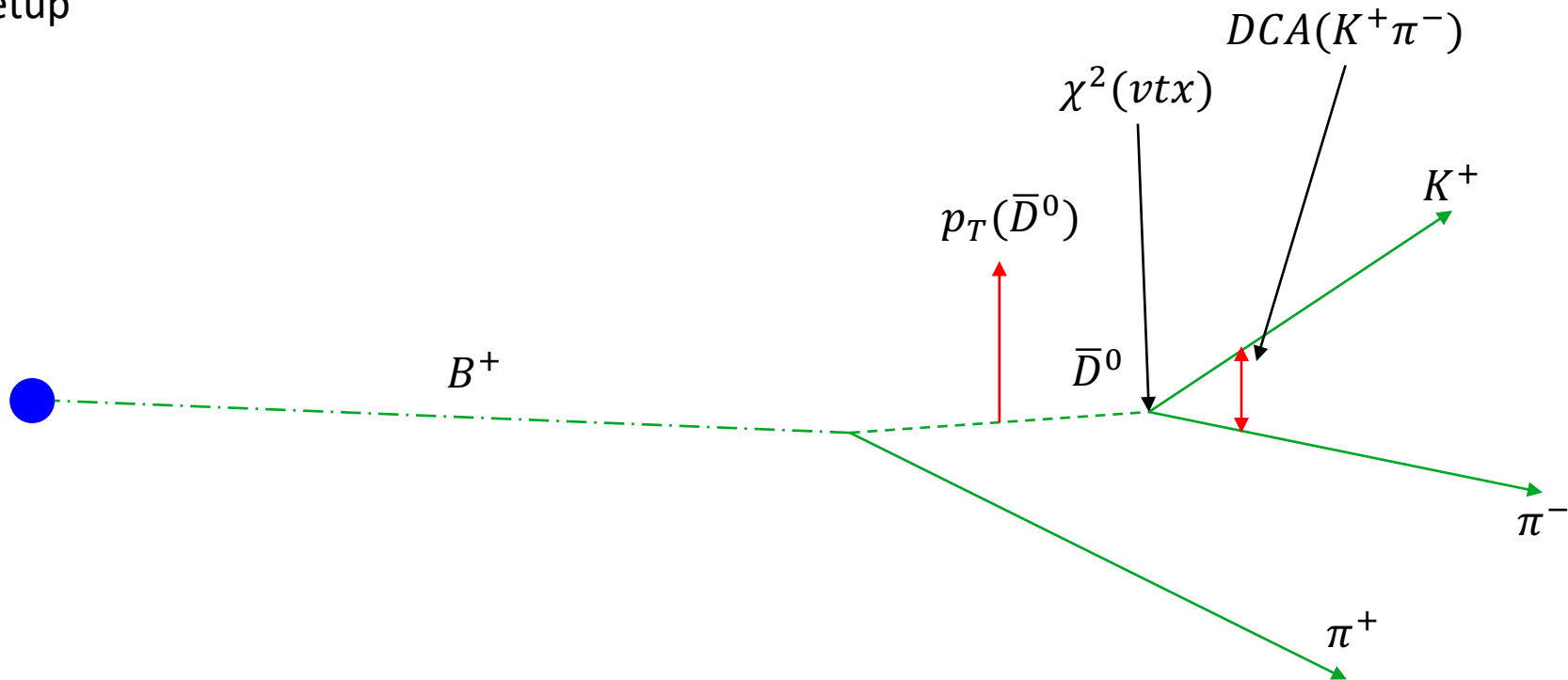02/22/2021

HF TG Meeting

Production Status and Info

- MDC info has been migrated [here](#) for legacy purposes

- [KFParticle has a new twiki](#) with info on how to setup, what options are available and what the output branches mean

- We passed 100M total events on Saturday (we got 3M extra b-bbar)

- [KFParticle had a new release on Thursday](#), associated [update to examples](#) was merged on the same day

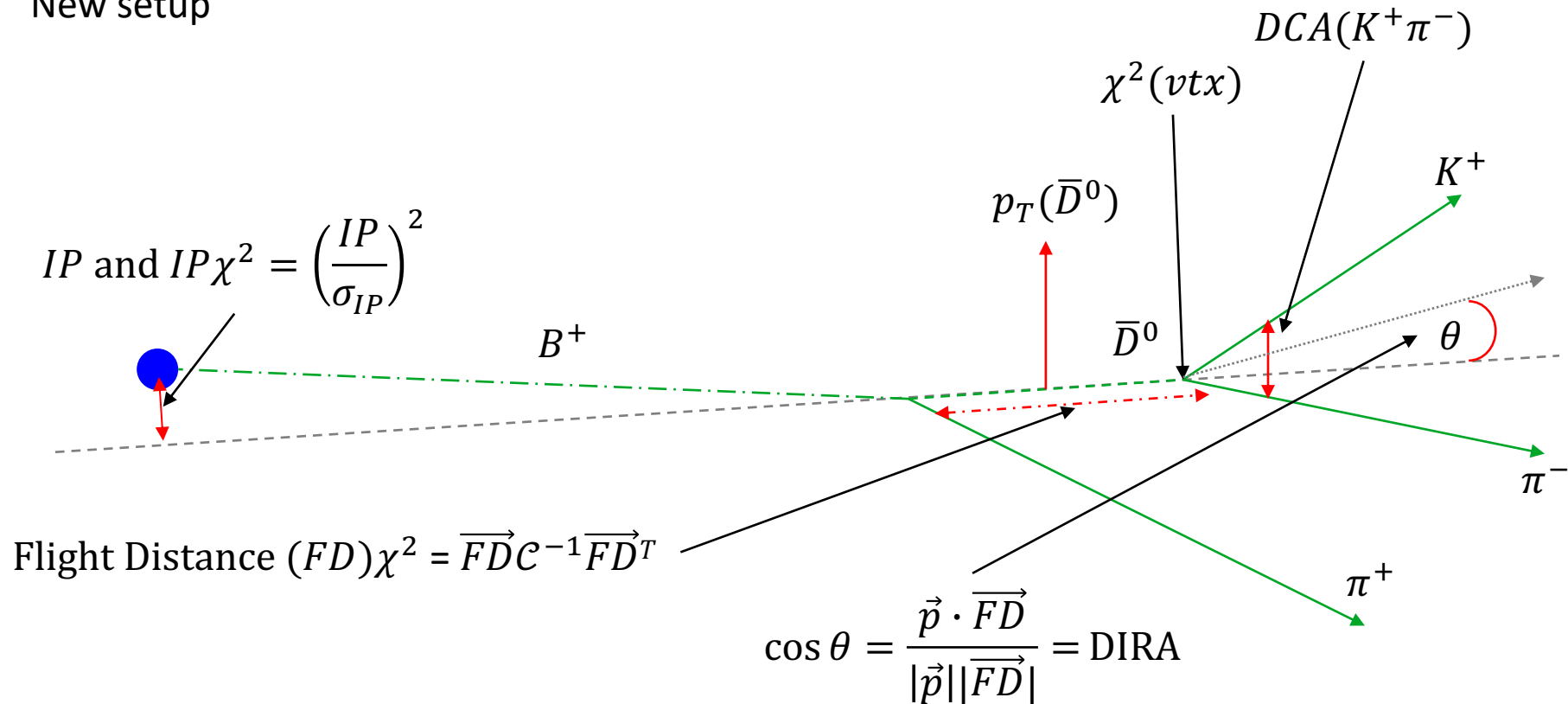| Production Information	Value (as of 2021/03/08 09:54 ET)
No. c-cbar files in bookkeeping	46999
No. c-cbar events in bookkeeping	50428859
No. b-bbar files in bookkeeping	48985
No. b-bbar events in bookkeeping	53066479

HF MDC1 Status
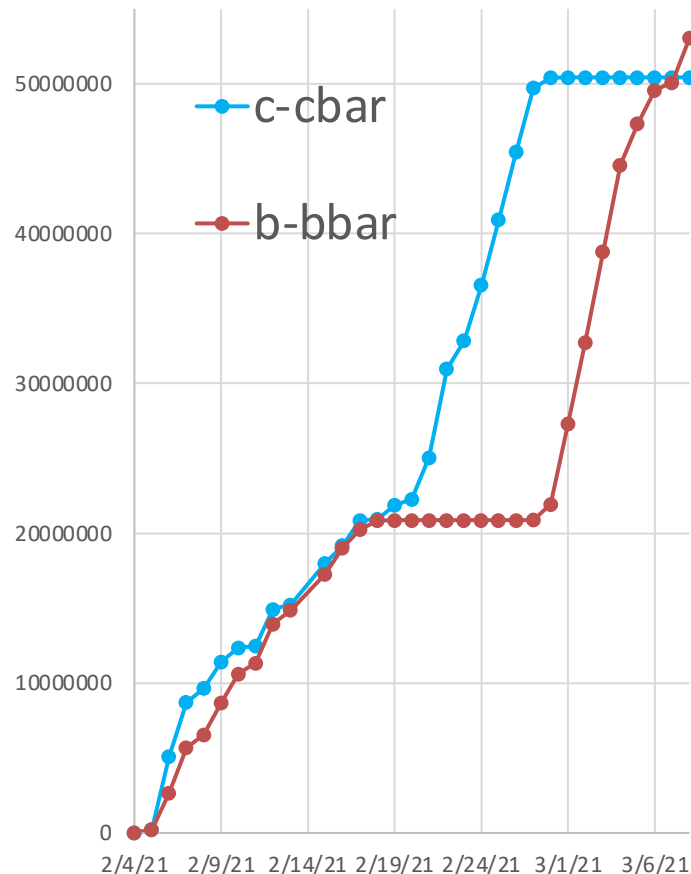
Adding more resonance options

Old setup

$DCA(K^+\pi^-)$

$\chi^2(vtx)$

$p_T(\overline{D}^0)$

K^+

B^+

$\overline{D}^0$

π^-

π^+

Adding more resonance options

New setup

$$DCA(K^+\pi^-)$$

$$\chi^2(vtx)$$

$$IP \text{ and } IP\chi^2 = \left(\frac{IP}{\sigma_{IP}}\right)^2$$

$$p_T(\overline{D}^0)$$

$$K^+$$

$$B^+$$

$$\overline{D}^0$$

$$\theta$$

$$\pi^-$$

Flight Distance $(FD)\chi^2 = \overrightarrow{FD}\mathcal{C}^{-1}\overrightarrow{FD}^T$

$$\pi^+$$

$$\cos\theta = \frac{\vec{p} \cdot \overrightarrow{FD}}{|\vec{p}||\overrightarrow{FD}|} = \text{DIRA}$$

Final comments

- This Friday (03/12/2021) we will have a practice session for the Software and Computing review

- MDC will be highlighted as an achievement of the collaboration

- Plots are requested from each TG

- My personal opinion on plots are:

  - **Invariant mass and possible prompt/non-prompt separation from:**

    1. $D^0 \rightarrow K^- \pi^+$
    2. $D^+ \rightarrow K^- \pi^+ \pi^+$
    3. $\Lambda_c^+ \rightarrow p K^- \pi^+$
    4. $D^{*+} \rightarrow (D^0 \rightarrow K^- \pi^+) \pi^+$

- Chris has requested a note on our simulations needs

  - **This covers 2021 – 2025**

  - **This is to be discussed tomorrow at 1pm ET**

Backup

Some Footer

Issues from last meeting

1. We had too many vertices in our vertex map
   - Pythia generated many truth vertices which were passed down our nodes
   - Joe implemented a fix where we can recalculate the PV from the track map
   - [Latest version of examples has code to run this](#)
2. Truth matching caused a crash for some events
   - We had a null pointer returned by ghost tracks
   - Package was updated to return a value of 0 for true ghost tracks. Use track_x_true_ID to find ghost tracks (their true ID is 0)
3. Track ID and mass bug
   - Only affected reconstructions with a mix of resonances and reconstructed tracks
   - Only affected those reconstructions if resonance mass was NOT constrained
   - Lone tracks had no mass or PID
   - Latest release fixes this

New issues

1. Tracks had no χ^2 or nDoF measurements in nTuple
    - This was calculated properly during selection but the variables weren't passed as the objects were copied
    - Latest version of package fixes this
2. Some tracks could be written to nTuple out of order
    - The reordering of tracks when being written out got confused. We could occasionally mix pions and kaons, for example
    - Latest version fixes this and also keeps tracks that are associated to resonances together
    - Tracks from resonances are now named with their mother
3. Zombie nTuples could be created if no events were found in your selection
    - The creation of the nTuple has been moved from Init() to process_event() and only when the first candidate has been found